

ABSTRACT OF THE DISCLOSURE

A semiconductor device containing a diffusion barrier layer is provided. The semiconductor device includes at least a semiconductor substrate containing conductive metal elements; and, a diffusion barrier layer applied to at least a portion of the substrate in contact  
5 with the conductive metal elements, the diffusion barrier layer having an upper surface and a lower surface and a central portion, and being formed from silicon, carbon, nitrogen and hydrogen with the nitrogen being non-uniformly distributed throughout the diffusion barrier layer. Thus, the nitrogen is more concentrated near the lower and upper surfaces of the diffusion barrier layer as compared to the central portion of the diffusion barrier layer. Methods for  
10 making the semiconductor devices are also provided.

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